Name: *Student id:* *Section:* *Serial#:*

QUESTION #	1	2	3	4	TOTAL
MAX POINTS	8	12	8	12	
POINTS EARNED					

UNIVERSITY OF BAHRAIN
DEPARTMENT OF COMPUTER SCIENCE
CS241: ASSEMBLY LANGUAGE PROGRAMMING

COLLEGE OF INFORMATION TECHNOLOGY
SECOND TEST
TIME: 75 MINUTES
DATE: JAN 02, 2008

QUESTION ONE: **{8 pts}**

Given a predefined array bb consisting of 64 unsigned word values, convert the following C++ code into equivalent assembly code:

```
int ct = 0 , j = 0;
while (j < 64 )
  { if(bb[j] >= 40 && bb[j] < 50)
      ct++; j++;  }
```

```
        .DATA
CTR     DWORD   0

        .CODE
        MOV ESI, 0          ; K → ESI

WHILE:  CMP ESI, 63 * 2
        JG  ENDW

        CMP BB[ESI], 40
        JB  NEXT

        CMP BB[ESI], 50
        JAE NEXT

        INC CTR

NEXT:   ADD ESI, 2
        JMP WHILE
ENDW:
```

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QUESTION TWO: Write a sequence of assembly instructions to perform each of the following tasks:

1) Give ONE instruction to set bits 5 to 11 in BX register. Leave other bits in BX unchanged **{2 pts}**

```
OR      BX, 0FE0H
```

2) Give No more than 2 instructions to divide **EAX / EDI**. {2 pt}

```
CDQ
IDIV   EDI
```

3) Give No more than 2 instructions to SET all bits in **eflags** register. {2 pt}

```
PUSH   0FFFFFFFFH
POPFd
```

4) Give No more than 2 instructions to shift right the entire value in **CX:DX** ONE bit . {2 pt}

```
SHR    CX, 1
RCR    DX, 1
```

5) Give No more than 2 instructions to store in ESI register the quotient of dividing BL register by 16. BL register may contain any unsigned value. **{2 pts}**

```
MOVZX  ESI, BL
SHR    ESI, 4
```

6) Give No more than 2 instructions to display the value of the last 2 words saved on the stack. **{2 pts}**

```
POP    EAX
CALL   WRITEINT
```

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QUESTION THREE: **{8 pts}**

a)
```
MOV  BX, 49F3H
ROL  BX, 4
XOR  BX, 0E07FH
```

BX = 7F4B H

b)
```
MOV  AX, 70F2 H
MOV  BX, 459CH
TEST BX, AX
```

BX = 459C H

c)
```
MOV  BX, 6C4FH
NOT  BX
AND  BX, 4AC6H
```

BX = 0280 H

d)
```
MOV  BX, 4F7AH
MOV  CX, 2F04H
SHL  BX, CL
```

BX = F7A0 H

e) What will be in registers BX and SP after executing the following instruction sequence?

```
        MOV     SP, 2FD0H
        MOV     CX, 4AF7H
        MOV     BX, 9F4CH
        PUSH    SP
        PUSH    CX
        CMP     CX, -2
        JL      L2
        POP     BX
        ROR     BX,8
L2:     XOR     BX, CX
```

SP = 2F CE H

BX = BD BD H

f) If "JL L2" is replaced by "JB L2", what will be in registers BX, SP after executing the above code?

SP = 2F CC H

BX = D5 BB H

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QUESTION FOUR: **{12 pts}**

Write a complete assembly program that uses the procedure SMALLER to find out and print (in proper format) the SMALLEST element of an array hh consisting of 64 signed words. Write the procedure SMALLER such that it receives 2 memory words: a and b and returns in a word res the smaller of a and b as a result.

```
        INCLUDE IRVINE32.INC

        .DATA
MYARR   SWORD   -10,+30,-322,-80,+99,-4,+60,+98,-34,+177,-90,+55
M2      BYTE    " THE SMALLEST ARRAY ELEMENT IS: ",0
small   sword   ?

        .CODE
;   ************************************
Smaller proc    a: sword, b: sword, res: ptr sword
        MOV     aX, a
        MOV     bx, b
        mov     edi, res
        mov     word ptr [edi], ax
        CMP     aX,bx
        JLE     DONE
        mov     word ptr [edi], bx
DONE:   ret
smaller endp

BEGIN   PROC

;   FINDING SMALLEST ELEMENT ****************
        MOV     ECX, LENGTHOF MYARR - 1
        MOV     ESI, 0

        MOV     dx,MYARR[ESI]
        mov     small, dx
L8:     invoke  smaller, small, MYARR[ESI+2], addr small
        ADD     ESI,2
        LOOP    L8
;   DISPLAY SMALLEST ELEMENT  *****************
        LEA     EDX, M2
        CALL    WRITESTRING

L2:     MOVSX   EAX, small
        CALL    WRITEINT
        CALL    CRLF
        EXIT
BEGIN   ENDP
        END     BEGIN

;  THE SMALLEST ARRAY ELEMENT IS: -322
```